

# Correlation between Mandibular third Molar Impactions and the Skeletal Face Type

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## ABSTRACT

**Aim:** To investigate the correlation between mandibular third molar impactions and the skeletal face type both sagittally and vertically.

**Study design:** Cross-sectional study

**Place and duration of study:** Avicenna dental hospital, Lahore from July 2019 to September 2021.

**Methodology:** Pre-treatment records of 135 patients visiting the Orthodontics department of Avicenna Dental Hospital, including history, clinical examination, photos, study casts and radiographs were retrospectively studied to determine the skeletal face type and status of mandibular third molars. Relationship of skeletal face type was correlated with the impacted third molars.

**Results:** Mean age of the patients was 22 years with more (67%) patients being females. Mandibular third molar impactions were 39.58% in skeletal Class I, 57.53% in Class II and 35.71% in Class III respectively. Both mandibular third molars were found impacted in 64.28% dolichofacial, 53.96% mesofacial and 53.33% brachyfacial patients.

**Conclusion:** Mandibular third molars are impacted in many patients reporting to Orthodontics department. Both mandibular third molars were significantly more impacted in dolichofacial skeletal face type and skeletal Class II individuals.

**Keywords:** Skeletal face type, dolichofacial, brachyfacial, mesofacial, growth pattern, molar impactions, Orthodontics.

## INTRODUCTION

Third molars are the most frequently impacted teeth in the oral cavity<sup>1</sup>. The prevalence of third molar impaction is quite variable depending upon the ethnic variability and is generally reported to be between 12.31% -68.6%<sup>2-6</sup>. Impaction of third molars is more common in mandible than maxilla and they are more commonly impacted in females than in males<sup>3,7</sup>. Impacted third molars are considered to be causative factors for various pathological conditions like dental caries, resorption of the roots of adjacent teeth, pericoronitis, dentigerous cysts and they may also cause neoplasms<sup>8</sup>. Moreover, they are also considered to cause incisor crowding in the mandible after orthodontic treatment<sup>9</sup>.

Many studies have been conducted to determine the etiology of third molar impaction. One of the most significant factor in the etiology of mandibular third molar impaction is the lack of retromolar space (space between the distal surface of second molar and the ramus)<sup>10</sup>. Other important causes include size of the mandible, direction or rotation of growth of the mandible (which determines the face type i.e. mesofacial, brachyfacial or dolichofacial)<sup>10</sup>. Configuration of the ramus of the mandible has also been studied to be the cause of the mandibular third molar impaction<sup>11</sup>.

The craniofacial morphology varies according to the population in the world and this may also explain the difference in the frequency of the impacted mandibular third molars worldwide<sup>2,12,13</sup>. Skeletal face types that provide increased space in the arch are hypothesized to have fully erupted mandibular third molars. Brachyfacial individuals have a short anterior face height and a wide face, whereas dolichofacial individuals have a long anterior face height and a narrow face. Inconsistencies in the literature exist regarding the association of craniofacial morphology and mandibular third molar impaction<sup>12,13</sup>.

So, the aim of this study is to investigate the correlation between mandibular third molar impactions and the skeletal face type both sagittally and vertically.

## MATERIAL AND METHODS

This cross-sectional study consisted of digital lateral cephalometric and panoramic radiographs of 135 individuals, aged 18–25 years, who had visited the Department of Orthodontics, Avicenna Dental Hospital between July 2019 and Sep 2021, after approval from Institute's Research Ethics Review Committee. The inclusion criteria was: (1) presence of complete normal mandibular dentition (2) presence of mandibular third molars which have complete root formation and either fully erupted or impacted (3) presence of initial orthopantomogram and lateral cephalometric radiograph. The exclusion criteria was: (1) syndromic patients (2) history of orthodontic treatment (3) missing or extracted permanent teeth. All cephalometric radiographs were traced and analyzed manually by the same orthodontist (H.G). Eight landmarks and seven linear and angular measurements were identified. Landmarks identified were Nasion (Na), Sella (S), Anterior nasal spine (ANS), Posterior nasal spine (PNS), Gonion (Go), Gnathion (Gn), Menton (Me). The skeletal facial type was determined by Mandibular plane angle (SN-MP) and maxillomandibular plane angle (MMA), where mean of these two values is  $32 \pm 4$  and  $25 \pm 4$  respectively and this value was regarded as mesofacial. SN-MP angle of  $> 36^\circ$  and MMA  $> 29^\circ$  was regarded as dolichofacial and SN-MP an angle of  $< 28^\circ$  and MMA  $< 21$  as brachyfacial. Dolichofacial is the term used to describe a long anterior face height and a narrow face ("the long face syndrome") and brachyfacial describes a short anterior face height and a broad face. For sagittal classification of skeletal face type, the angular measurement of ANB was used such that Class I skeletal relationship was characterized by ANB  $0-4^\circ$ , Class II ANB  $> 4^\circ$  and Class III ANB  $< 0$  (24). Patients were divided into three classes based on their vertical face type i.e., dolichofacial, mesofacial and brachyfacial. Similarly, patients were again divided into three categories based on their sagittal skeletal pattern i.e., Class I, II and III. Digital panoramic radiographs were used to evaluate the position and angulation of impacted mandibular third molars.

The data recorded was the age of the patient, gender, mandibular plane angle, maxillomandibular plane angle, skeletal Class of the patient; Class I, II or III and mandibular third molar status whether impacted or erupted.

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**Statistical analysis:** Statistical analysis was used to analyze the data using SPSS 22. The frequency of cases in each group according to skeletal face type was recorded and the status of the mandibular third molars was evaluated. Differences among these groups were calculated using Pearson correlation test.

**RESULTS**

Mean age of the patients was 22 years with ages ranging between 19-25 years. 90(67%) patients were females while 45(33%) were males. Out of the total 135 patients, 48 patients were skeletal Class I, 73 were Class II and 14 patients were Class III.

Mandibular third molar impactions were 39.58% in skeletal Class I, 57.53% in Class II and 35.71% in Class III respectively. Out of all the cases, 10.4 % skeletal Class I patients, 5.47% of Class II and 14.28% of Class III had only one impacted mandibular third molar.

When studying the vertical skeletal face pattern, we found a total of 42 dolicofacial, 63 mesofacial and 30 brachyfacial patients. Both mandibular third molars were found impacted in 64.28% dolicofacial, 53.96% mesofacial and 53.33% brachyfacial patients while 0.04% dolicofacial, 9.52% mesofacial and 10% brachyfacial had only one impacted mandibular molar.

Table 2: Frequency of impacted molars in Class I, II and III respectively.

Skeletal Class (Sagittal)	n	Both Impacted	Both erupted	Only one impacted	P value
Class I	48	19 (39.58%)	24 (50%)	5 (10.41%)	0.07
Class II	73	42 (57.53%)	27 (37%)	4 (5.47%)	0.05*
Class III	14	5 (35.71%)	7 (50%)	2 (14.28%)	0.06

Table 1: Frequency of impacted molars in different skeletal face types

Skeletal face type (vertical)	n	Both Impacted	Both erupted	Only one impacted	P value
Dolicofacial	42	27 (64.28%)	13 (30.9%)	2 (0.04%)	0.05*
Mesofacial	63	34 (53.96%)	23 (36.50%)	6 (9.52%)	0.07
Brachyfacial	30	16 (53.33%)	11 (36.66%)	3 (10%)	0.06

Figure 2: Frequency of both impacted, only one impacted and both erupted in dolicofacial, mesofacial and brachyfacial face types respectively.

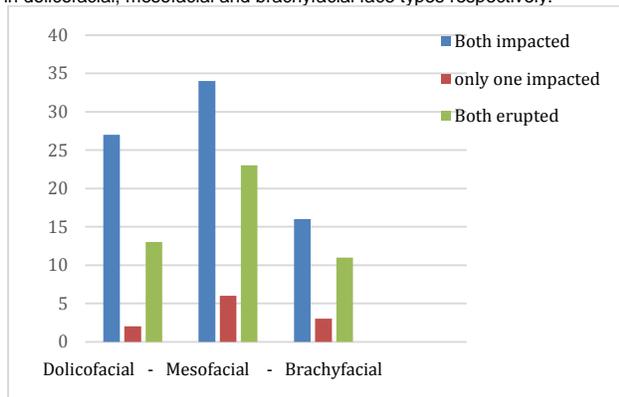
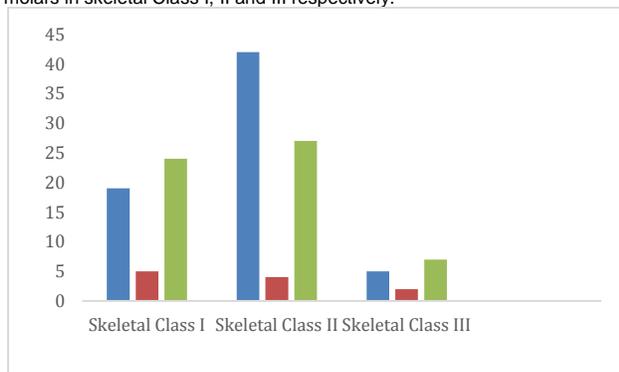


Figure 1 Frequency of both impacted, only one impacted and both erupted molars in skeletal Class I, II and III respectively.



**DISCUSSION**

Third molars are important for the orthodontist in the treatment planning of orthodontic cases especially when deciding for the distalization of first or second molars, extraction of premolars or other permanent teeth<sup>14,15</sup>. The results of our study showed that the overall frequency of mandibular third molar impaction was 65%. These results may vary from other studies which also evaluated the frequency of mandibular third molar impactions in different

populations of the world. This variation of results may be due to the differences in the population under study<sup>2,6</sup>.

We aimed to investigate the correlation of mandibular third molar impactions with the skeletal facial pattern both sagittally and vertically. The skeletal facial pattern of the subjects was determined using various measurements on the lateral cephalometric radiographs. We found out that mandibular third molar impaction was significantly higher in the skeletal Class II individuals with retrognathic mandible than in Class I and Class III subjects. The results of this study are in agreement with Richardson who suggested a higher incidence of mandibular third molar impaction in Class II individuals. These individuals had a short and narrow mandible<sup>16</sup>. Similar results were obtained in a study by Jain S et al, who also found an increased number of impacted mandibular third molars in skeletal Class II individuals<sup>17</sup>. Numerous other studies were carried in which the results obtained were different to the abovementioned studies<sup>18</sup>. A higher incidence of mandibular third molar impaction was found in Class III malocclusions by Abu Alhaja et al as compared to Class II individuals<sup>18</sup>. This was found to be due to the reduced retromolar widths in Class III subjects.

We also aimed to correlate mandibular third molar impactions with the skeletal face patterns vertically. Our findings showed that mandibular third molar impaction was more common in dolicofacial (64.28%) than brachyfacial (53.33%) and mesofacial (53.96%) individuals. The results of our study are similar to the findings of Breik and Grubor who found a higher incidence of mandibular third molar impaction in long face individuals than in other face types<sup>(2)</sup>. They concluded that the short face growth pattern allows more remodeling resorption of the anterior border of the ramus and more space in the arch and hence lower incidence of third molar impaction than in long face growth pattern. They also found out that that due to the vertical direction of growth of the condyle and short mandibular length, the dentition erupts in a backward direction. This causes space deficiency in the arch for the mandibular third molars and hence leads to their impaction.

Similar results were obtained in a local population by Bashir S et al who found a lower incidence of mandibular third molar impaction in short face individuals than in long face and normal face subjects<sup>19</sup>. In a recent study, Viqar S et al found a higher frequency of impacted third molars in dolicofacial face type in a local population. The majority of erupted mandibular third molars were found in short face skeletal pattern<sup>12</sup>. They based their results on the fact that the greater resorption at the anterior border of the ramus provides increased space in the arch for the mandibular third molars to erupt. Similarly in another study, Tassoker M et al

found that the mandibular third molar impaction was more common in long face individuals than in brachyfacial subjects<sup>13</sup>. Sapkota et al also found decreased mandibular third molar impactions in brachyfacial type compared to mesofacial and dolichofacial type in Nepalese population<sup>20</sup>. Hasan KM et al evaluated the frequency of third molar impaction in various vertical skeletal face types and found that long face pattern individuals had a higher percentage of impaction than other facial types. They found a significant correlation between the length of the mandible and mandibular third molar impaction<sup>21</sup>.

The limitation of the study includes the sample size. Since this is a single center study so a large sample size could not be taken. Hence, the results of this study cannot be generalized for the whole population. Another limitation is the age range of the patients, which is between 18-25 years. Previously it was thought that mandibular third molar erupts between the age 18-25 years. However, according to the recent evidences, it may erupt even after this age and continue to erupt into functional occlusion until the age of 32 years<sup>22,23</sup>. So, labelling a mandibular third molar impacted between the age 18-24 years would be premature.

It is further suggested that in future similar studies with larger sample sizes and population from various ethnic backgrounds may be carried out.

## CONCLUSION

Within the limitations of this study, it can be concluded that mandibular third molars are impacted in many patients reporting to Orthodontics department. Both mandibular third molars were significantly more impacted in dolichofacial skeletal face type and skeletal Class II individuals when compared to other skeletal face types and that mandibular third molar impaction and skeletal face pattern are correlated.

**Conflict of interest:** Nil

**Author's contribution:** HG: Principal author, Proposed topic, Basic study design, RZ: Co-Author, Data collection, literature search, NB: Co-Author, Data analysis, VJ: Co-Author, SH & KH: Data interpretation

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